

# Urbanization alters herbivore rodent composition but not abundance

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## Introduction:

- Desert ecosystems are amongst the fastest urbanizing areas on the planet, causing desert plant communities to shift due to the influence urbanization has on plant productivity and community composition.
- Urbanization can increase the abundance and species richness of herbivores within the city, due to the concentration of food resources and removal of predators.
- Despite this assumption, previous research at the CAP-LTER has shown that herbivory at Sonoran Desert sites within and outside the city has led to equally reduced biomass.
- It is unclear whether this lack of difference in herbivory is the result of unaltered herbivore populations or altered activity levels that counteract the differences in population densities.
- We have quantitatively surveyed small rodent populations at four sites inside and four sites outside of the city core during the fall and spring in order to determine whether abundances and diversity differ significantly between urban and rural sites.
- We hypothesized that there are higher small rodent abundances inside the city, but greater diversity outside.



## Methods:

- Small rodent surveys were conducted at eight Central Arizona-Phoenix Long-Term Ecological Research project (CAPLTER) sites (Figure 1).
  - Four sites inside of the city were paired with four sites outside of the city.
- Mice, squirrels, and rats were quantified using the live capture-release method:
  - 100 Sherman traps and 8 larger wire traps were baited and set for two consecutive nights at each site. Rodents were identified the following mornings.
  - On each of four weekends, one set of paired sites were surveyed, with a total of 216 traps set per trapping event.
  - In order to target diurnal rodents as well, traps at each site were allotted 2-3 hrs of extra daylight before collection while data was being obtained from its pair.
  - Traps were placed in key habitat types, such as under Bursage, Palo Verde, etc.
  - Traps were scattered within a 20,000 square meters area at each site.
- Sites were surveyed in fall (September-October) and in the spring (March-May) in order to account for the fluctuation of populations with the seasons.

## Results:

- Average differences in small rodent abundances inside and outside of the city during the Fall and Spring were found to be insignificant ( $P = 0.184$  for Location) as seen in Figure 2.
- Figure 3 illustrates that the average differences between small rodent species diversity inside and outside the city were also found to be insignificant, ( $P = 0.341$  for Location).
  - This may be due to the fact that the South Mountain sites had relatively high diversity when compared to the other urban sites.
- However, when comparing average genera diversity inside and outside of the city, a significant difference was observed ( $P = P < 0.01$  for Location), as illustrated in Figure 4.
- Trapping events also suggest that certain species can only be found in parks outside of the city as opposed to inside, and vice versa.
  - Merriam's Kangaroo Rats and Grasshopper Mice, for example, were only identified at rural sites (Figure 5).

## Conclusion:

- According to the data, the commonly assumed difference in abundance does not seem to apply to small rodent herbivore populations in a desert city when manicured environments are excluded.
  - The equal consumptions of plant biomass observed inside and outside of the city may simply be due to the insignificant differences in small rodent abundances.
- Differences between the small rodent species observed at rural and urban sites were also found to be insignificant.
  - The relatively high species diversity observed at the South Mountain sites may be due to the fact that it is bigger than the others, and may therefore be able to support higher diversity.
- The significant difference between genera diversity observed highlights the fact that certain genera of small rodents dominate urban sites.
  - The Piestewa Peak and South Mountain sites are most similar in terms of rodent species composition.
  - Greater variation in species composition exists amongst rural sites.

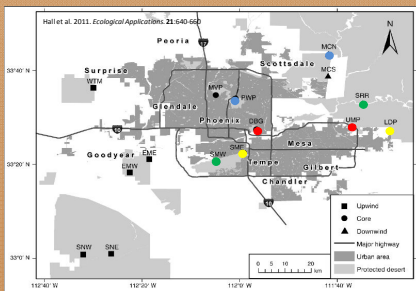


Figure 1: Depicted above are the ten sites of herbivory study; eight of which are currently being sampled in pairs.



Figure 2 and 3: Fall and spring averages of small rodent abundances and species (with standard errors) identified at rural and urban sites.

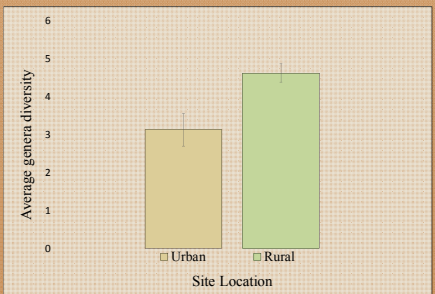


Figure 4: Fall and spring small rodent genera averages (with standard errors) identified at rural and urban sites.

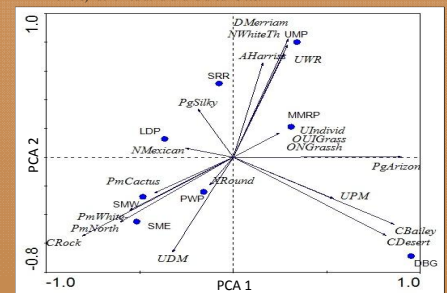


Figure 5: Species ordination of all rural and urban study sites

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